Section 6-9: Inverse Variation

By the end of this lesson, you should be able to answer:

- How do you solve problems involving inverse variation and inverse square variation functions?

Where you might see this in the real world:

- Music, physics, industry, travel

Define the following terms:

1. Inverse variation

3. Inverse square variation

In our last lesson, we looked at direct variation. This was a function of the form $y = kx$ or $y = kx^2$. In these problems, our domain was being multiplied by our constant of variation. Inverse variation is similar, but instead of multiplying our domain by k, we will divide.

Inverse variation function:

Inverse square variation function:

You will notice there are two ways to write out our equation. Either way is accepted and will give the same answers. However, one form of the equation may better fit the situation, so be able to write out inverse variations in both ways.

Also, similarly to the direct variation, we will see "y varies inversely as x" and "y is inversely proportional to x" for the equations. When trying to figure out which variation is going on, just look for the word "direct" or "inverse."

Example 1: The force of gravitational attraction between two objects varies inversely as the distance between them. If two objects have a gravitational force of 550 newtons (N) when they are 2200 m apart, how far apart are they when their gravitational force is 665.5N?

Notice that just like in the direct variation problems, we can set up a situation to find our constant of variation then apply it to the situation with different values. This also goes for inverse square variation functions.

Example 2: The weight of a body is inversely proportional to the square of its distance from the center of the Earth. If a man weighs 147 lb on Earth's surface, what will he weigh 200 miles above Earth? (Assume Earth's radius to be 4000 mi.)

Example 3: Assume y varies inversely as x.

a. When $x = 10$, $y = 15$. Find y when $x = 5$.

b. When $x = 2$, $y = 10$. Find y when $x = 40$.

Homework:

"If people only knew how hard I work to gain my mastery, it wouldn't seem so wonderful at all." - Michelangelo Buonarroti